Proceedings of the Fábos Conference on Landscape and Greenway Planning

Volume 5
Number 1 *Greenways and Landscapes in Change*

Article 36

2016

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Introduction

The artificial Danube Island is today an important urban greenway and a crucial element of Vienna's green network (Stadtentwicklung Wien, 2015). It is the result of two major flood protection projects that have had a fundamental impact on the Danube riverscape in Vienna. From 1870 to 1875 the branching river was straightened into one main riverbed with a large parallel inundation area of 825 hectares of almost flat ground. Overflows of the swiftly moving alpine river were then limited, but flooding remained a risk. In view of this, 100 years later, the inundation area was transformed into a 160-meter-wide flood-relief channel and an artificial island parallel to the main stream. The island is 21.1 kilometers long and 200 meters wide on average. A mere technical project in 1969, the island was later transformed into a multipurpose greenway in the course of an interactive planning process that lasted almost twenty years.

Taking the artificial Danube Island as a case study, the paper focuses on the interrelationship of site, planning process, and urban design. With this in mind, the objectives of this paper are

- to analyze the role of greenways in Vienna's urban development plans;
- to review the history of the island and the interaction of the actors involved;
- to analyze the shift in planning strategies and the consequences this has had on form, function, and meaning at site scale; and
- to discuss how the findings can inform the transformation of a technical infrastructure project into a multifunctional greenway.

Background and Literature Review

In past decades most major cities in Europe elaborated urban development plans. Among various concepts for open-space protection and development, there are essentially two fundamental strategies that can be differentiated: 1) spatial and landscape planning operating with greenways—in German-speaking countries the term Grünzüge (greenways) is used as a planning category; and 2) habitat networks developed by nature conservation (Haaren and Reich, 2006).

The first European greenways were established in the 1910s in German industrial areas like the Ruhr region (Haaren and Reich, 2006). Approximately at the same time (1905) a large portion of Vienna's woods and meadows, mainly in the west and south of the city, was legally protected from construction. This "Vienna Wood and Meadow Belt" has been a fundamental basis of twentieth-century green space planning. In Vienna, four comprehensive urban development plans have been elaborated since 1985, at ten-year intervals. They are visionary frameworks to guide spatial, economic, and social development. In 1985, the concept was basically a "green belt" and "green wedges" concept (Stadtentwicklung Wien, 1985).

In the urban development plan 2015 (called STEP 2025), this concept is complemented with a network model aiming at a better connection of major green spaces and increasing the living conditions in densely built-up urban areas. Four main network functions may apply to open spaces: "everyday life and recreation," "structuring the urban fabric," "ecosystem services," and "nature conservation." In STEP 2025 "greenways" and "green corridors" are important types of linear open spaces. Greenways are characterized as green-space connections with a minimum width of 30 meters. Green corridors are more than 50 meters wide and have great significance for all four network functions of green and open space. The spatial scale of greenways and green corridors (Ahern, 1995) is not an explicit topic in STEP 2025.

At about the same time as the first comprehensive urban development plan for Vienna was elaborated, publications on greenways increased. Fábos identified a diffuse state of greenway-type activities starting in the early 1980s. The projects and related discussions were not widely accessible, as the publications mainly appeared as conference proceedings (Fábos, 1995). Little has been published on greenway planning activities in the 1960s and 1970s in Europe.

The increase in greenway planning projects and the study of this idea led to a classification of three major types of greenways. Fábos (1995) differentiates between "ecologically significant corridors and natural systems," "recreational greenways," and greenways with "historical heritage and cultural value." He also states that the three types are increasingly overlapping in comprehensive greenway systems or networks. Ahern (1995) provides a view of greenways as a "complex and variable strategic approach to landscape planning for sustainable landscapes."

The design aspects of greenway planning are mentioned but little is published with this focus. Walmsley (1995) discusses greenways as shapers of urban form but does not address the site scale. Generally, the topic of urban river

design has gained importance in previous years. Rivers have been elevated into prestige-laden areas for social urbanites to gather (Prominski et al., 2012). A large number of greenways are along rivers (Ahern 1995) and therefore the topics flood protection, ecology, and the accessibility and use of open space are crucial (Prominski et al., 2012). The necessary combination of these topics also "brings together a range of formerly divergent disciplines such as civil engineering, landscape architecture and wetland ecology," the importance of which Searns (1995) stresses for third generation greenways.

Since the 1990s a large body of knowledge on greenway planning has been elaborated showing the need for further research into earlier periods of planning, especially the 1960s and 1970s in Europe, and into the role of design in greenway planning at site scale.

Methods

The findings of this paper are based on a review of publications on the Danube Island, thus following an inductive research approach. The literature review covers the history of the area, the island, the planning process, and the actors involved. Urban planning concepts and development plans are analyzed to determine the role of the river and of the artificial island in planning strategies for open space development and protection. The interrelationship of site and design is elaborated by analyzing regulation schemes and site construction plans. The results are assessed by site visits.

Results

In the 1980s the final phase of constructing the Danube Island (completed in 1988) and the elaboration of the first comprehensive urban development plan, STEP 85 (Stadtentwicklung Wien, 1985) took place contemporaneously. In STEP 85 the function of the Danube landscape is specified as "green band," important because of its easy accessibility from the city. The Danube area is a separate category in addition to "green belt," "green wedges," and "green way." "Green connections" should expand the pedestrian and cycle network. In STEP 05 five different landscapes are identified which constitute the characteristic Viennese landscape of the city region. The connectedness of the green and blue infrastructure of Vienna and the surrounding region is highlighted in the strategic map of green spaces. In STEP 2025 (Stadtentwicklung Wien, 2015) the linear network of open spaces is emphasized. The Danube Island is categorized as a green corridor serving all four network functions due to its average width of 200 meters.

The Danube Island in its existing form and function is the result of a planning process lasting twenty years. Internal and external factors have influenced this process and shifted the project's focus, transforming it from a purely technical structure into a multifunctional greenway. From the 1880s up to the 1950s, urban planning ideas and projects aimed at bringing the built structure of the city closer to the Danube and initiated rapid urban expansion on the right bank of the former flood plains, while the left bank was transformed into a 450-meter-wide inundation area (fig.1). The huge potential of the Danube area as a multifunctional greenway was not a primary consideration.

Figure 1. Urban Danube network in 1960: cut-off Old Danube (left), inundation area and Danube River (right) (WStLA FL3138)

Nor was it at the beginning of the island project in the late 1950s and 1960s, when the planning process started as a flood protection project. But it was only after the global rise of postmodern environmentalism in the early 1970s and, at the local level, serious public concern over the continuous destruction of the urban wetland relicts that the planning process was politicized (Redl and Wösendorfer, 1980). Expert advisers strongly recommended the initiation of a design process (Gruen, 1972) and stressed the crucial importance of the Danube and its adjacent landscapes as a greenway linking and developing the urban fabric (Woess and Loidl, 1974). The design process for the island started with two design competitions in 1973–75, although the first construction work had already begun in 1972. In response to the competing solutions and visions, an interactive planning process, the "Vienna Model," was developed to bring together the different actors and decision-makers in planning, urban, and landscape design as well as in administration.

During this long ongoing planning process the focus of the project gradually shifted from pure flood protection toward stressing the infrastructural, ecological, and societal functions of the river within the urban network. Early landscape designs for the island, dating from 1968, show that recreation was given high priority due to the island's landscape qualities, its dimensions, and its location in the urban fabric close to the city center. At that point however, the recreational use focused on institutionalized activities such as boating, swimming in pools, ball games, golf, and camping. Nevertheless, the development of new residential areas on the island was still being considered until 1976. Public transportation to the projected island—crucial to achieve sustainable and widespread public use—was improved by mere chance, when the Reichsbrücke, the main bridge connecting the center with the northern part of the city, collapsed in 1976. With the construction of a new bridge, the underground was extended, thus providing public transport to the new island (fig. 2).

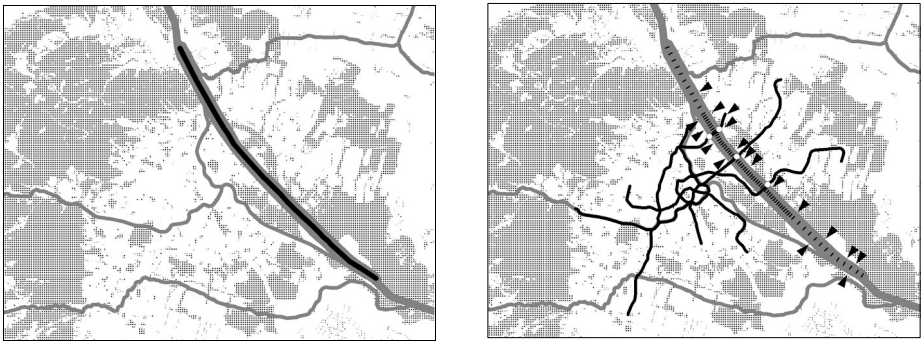

Figure 2. Left: The Danube Island (black line) as part of the blue and green infrastructure. Right: Subway lines and access to the Danube Island. The density of the hatching of the island indicates the intensity of design and recreational use.

The final landscape design by Gottfried + Anton Hansjakob and Wilfried Kirchner, which dates from the early 1980s, acknowledges the site's high potential for recreational activities and upgrades the landscape qualities of the former inundation area. The technical project of the 1960s had suggested a straight channel and an embankment of trapezoidal cross section, which would have fulfilled technical requirements but did not meet any recreational or ecological needs. The final landscape design instead differentiates the island's topography and bank line and—for the first time—offers access to the artificial channel "New Danube" as a place to swim. The island's core, connected to high-grade public transportation, is designed intensively like an urban park with sports fields, sunbathing areas, barbecue equipment, pontoons, and a water playground; all the facilities are publicly accessible at no charge. Small

takeaways and toilets enable visitors to spend a whole day on the Danube Island. The planting design, which is informed by the ecological understanding of the early 1980s, provides extensive woodlands and meadows. At both ends of the island, spacious areas are designed extensively to provide new aquatic habitats, where flora and fauna typical of river wetlands have gradually evolved. Nowadays the semi-natural sections of the island are "landscape-protected areas." Footpaths and cycle routes run along the whole length of the island and offer contrasting experiences of active recreation and wildlife protection. Five heavy floods between 1991 and 2013 have shown that the New Danube can serve its purpose as a crucial flood detention basin. Thus, the Danube Island and its adjacent channel meet the major interests of urban riverscape design—flood protection, ecology, and the accessibility and use of open space.

Over the last decades, the Danube Island has turned into a greenway of major recreational and ecological importance for the city and its zones of new urban densification on both sides of the river. As a linear green corridor, it links Vienna with the surrounding natural, agricultural, and cultural landscapes, providing recreational routes and zones for ecological and climatic exchange. Thus, the artificial Danube Island, cut-offs like the Old Danube, and the relict wetlands of Lobau as part of the Danube Floodplains National Park are unique aspects of the Danube riverscape stretching to the east all the way to Bratislava in the Slovak Republic.

Discussion and Conclusion

The planning and design of open spaces in general, and greenways in particular, are based on specific concepts and ideas that are influenced by specific planning traditions, values, and scientific approaches. All of these reflect specific relations of power and change over time (Jongman et al., 2004). The extremely long planning and realization period of the Danube Island and the New Danube clearly shows these interrelations. A pure infrastructure project initiated and planned by the municipal planning departments has gained in complexity due to a variety of forces and actors and has finally turned into a blue and green corridor with ecological, recreational, cultural, and aesthetic functions.

Multifaceted urban challenges need planning processes that involve decision-makers and experts from various fields. Among them, landscape architects play a crucial role. Landscape design effectively improves the quality and resilience of flood protection projects and helps to achieve the multifunctionality of third generation greenways. An effective design provides

accessibility to the waterfront and the water and facilitates various outdoor activities. These urban spaces with their different aesthetic, functional, and formal characteristics are essential for multiple use and site identities. The standard of urban ecology has improved, not only in extensively managed parts of the urban landscape but also in the intensively used zones of these landscapes, and by connecting the island and the channel to the larger system of the river. Thus, even a newly constructed landscape can upgrade an existing greenway and become an integral part of the urban green and blue infrastructure. The interactive planning process of the "Vienna Model" has already proved to be an appropriate tool to mediate these challenges and can be adapted for further urban projects.

Figure 3. The Danube Island situated between the New Danube in the foreground and the main stream in the background (author Marco Aldeia)

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